July of 1994, approximately a year from the date U.S. proposals are due. The IAC has just been recently organized.

While one year would seem time enough to prepare the U.S. proposals, several factors must be kept in mind: (i) frequently, supplemental NOI's must be issued as matters in dispute become clearer and potential solutions are developed; (ii) in addition to proposals for the work of the immediate conference, attention must be given to agenda items for the next two conferences to follow, which requires a fair amount of initial planning; (iii) the comments and proposals submitted to the Commission by the private sector must not only be analyzed by the Commission, but must also be coordinated with the NTIA and ultimately with the State Department, again a time-consuming process; and (iv) most significantly, if U.S. proposals are to have maximum impact at the conferences, those proposals should be finalized as early as possible, at least informally, for bilateral and multilateral meetings well in advance of the conference.[41/]

All of these factors in combination suggest the need for a decision on U.S. proposals much earlier than the summer of the year of the conference, preferably as early as the spring, some six to eight months prior to the conference. If this is a proper goal, then the Commission preparatory process must be initiated

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[41/] The finalization of proposals should also include, where possible, decisions in relevant domestic allocation proceedings so that the U.S. can avoid undermining its own effort at the international conference (e.g., domestic allocation of the 1970-1990 MHz band for terrestrial PCS after the band had been allocated to MSS at WARC-92, see supra note 13 and accompanying text).

no later than the first quarter of the year prior to the year of the conference.

AMSC believes that the use of an NOI and the establishment of an IAC are the most appropriate processes. AMSC recommends that an initial NOI be released routinely in the first quarter of the year between conferences, should be general in scope with a short time-frame for response. After prompt initial attention by the Commission, more specific NOIs could be issued later leading to concrete U.S. proposals.

The Commission's NOI suggests that it might maintain "an open docket" in this NOI. While AMSC has no objection to this approach, it is not clear how such an open docket will contribute to more timely preparation for each WRC. The subject matter will vary every two years and proposals for future agendas, and thus the substance of the NOI, will be in a constant state of flux.

IACs, created under the Federal Advisory Committee Act, in almost every case will be an appropriate addition to the NOI procedures. Experience shows that if industry is given the opportunity, a significant amount of consensus can be reached, with only the most intractable issues remaining for final Commission decision.

AMSC recommends one proposed change in the IAC process. Currently, representatives from other executive agencies -- particularly participating members in the IRAC -- attend IAC meetings as observers to the IAC deliberations and hence become well-informed as to the conflicting needs and claims of the private sector. This becomes a "one-way street" of information. AMSC would urge that the representatives from IRAC be officially designated to participate in the IAC process. To the extent not prohibited by national security concerns, these representatives should be encouraged to advise, consult, and coordinate with the private sector. The Government's use of the spectrum and its requirements are an integral part of the picture. Increased cooperation is critical. The earlier the consensus-building process starts between industry and government the better. In this fashion, the IAC process would benefit from much better exchange of information regarding the needs of the Executive Branch for existing and new radio spectrum and information regarding new government services in the developmental stage.

Under present procedures, the Government's requirements and the Government's current use of spectrum are not well coordinated with the IAC and the private sector. Accordingly, the IAC goes its own way preparing its private sector requirements and the IRAC goes its own way preparing government proposals. Both are finally coordinated at the last moment in meetings between FCC officials and NTIA officials with little input from the public on the Government's needs. AMSC suggests that this bifurcated development of U.S. policy will not prove effective under the new ITU Conference schedule.

The Commission also should consider establishing a joint committee made up of FCC and NTIA representatives that is open to the private sector. This committee would continuously study the issues under consideration for the next WRC and consider new matters for inclusion on later agendas. The committee could issue reports and recommendations. The composition of this committee would be open and would vary from year to year depending upon conference subject matter. Private sector representatives would be encouraged to participate. The leadership of this committee could be shared between the two agencies. Sub-working groups could be established for each of the major areas of attention. Currently, the NTIA through its IRAC process has established a similar program by creating its "Radio Conference Subcommittee," to coordinate the views of the various federal agencies regarding future WRC matters.

In the long run, demands by government and private sector users for the limited spectrum will increase substantially. The U.S. is one of the biggest users, through its public and private sectors, of telecommunications services and stands to benefit the most from continued growth in the international telecommunications services. Ongoing, thorough and cooperative preparatory efforts by all concerned are critical to long term U.S. interests. AMSC submits that the recommendations suggested will help meet this goal.

Conclusion

Based on the foregoing, American Mobile Satellite Corporation respectfully requests that the Commission adopt the proposals and recommendations set forth herein.

Respectfully submitted,

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TECHNICAL APPENDIX

SUMMARY

Based on frequency sharing constraints and United States spectrum occupancy identified by AMSC in preparations for the 1992 World Administrative Radio Conference ("WARC-92"),[1] it is evident that only 151 MHz of the 289 MHz allocated internationally in the 1 - 3 GHz range for the Mobile-Satellite Service ("MSS") may be available in the U.S. in the near-term. This limited spectrum availability stems mainly from numerous "local" frequency sharing problems between mobile earth stations and incumbent stations that are not earmarked for reaccommodation. Foreign spectrum usage and the attendant frequency sharing problems with MSS satellites serving the U.S. further reduces the MSS spectrum potentially available in the United States to approximately 56 MHz under the current technical provisions of the Radio Regulations ("RR"); this can be increased to about 96 MHz assuming favorable outcomes of the frequency sharing studies that are underway in the Radiocommunication Sector of the International Telecommunication Union ("ITU-R") and appropriate revisions to the power limits at 2160-2200/1970-2010 MHz for terrestrial stations and MSS satellites in RR Articles 27 and 28, respectively. Thus, given that "minimum" and "likely" MSS spectrum requirements of 177.6 MHz and 328.2 MHz were identified in the CCIR Report to WARC-92, it is clear that the 1995 World Radio Conference (WRC-95) should establish additional MSS allocations and modify the power limits in Articles 27 and 28 in order to enable the maximum utility of the current MSS allocations.

The new allocations to be proposed by the U.S. should be determined by culling and ranking processes that appropriately weigh interference, spectrum occupancy, and MSS requirements factors. Such a process is likely to show that an MSS (Earth-to-space) allocation at 2110-2120 MHz is among the best possible new allocations, mainly because it balances 20 MHz of MSS (space-to-Earth) spectrum that is likely to be orphaned by reaccomodation of fixed systems operating in the pair 2160-2180 MHz. MSS sharing with the space research (Earth-to-space, deep space) at 2110-2120 MHz is workable. The MSS (Earth-to-space) allocation suggested in the FCC's NOI for 2390-2420 MHz, however, is not likely to be highly rated as a result of the interference from foreign systems operating in other services and the high levels of noise power that would be generated in the receiving satellite

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[1] See, for example, Annexes A and B to Comments of AMSC, Gen. Docket No. 89-554, December 3, 1990, which is the source for frequency assignment data used in preparing this Technical Appendix. It is anticipated that updated assignment data will be considered in the FCC's Industry Advisory Committee but will have no effect on the conclusions reached herein.

by millions of Industrial, Scientific, and Medical ("ISM") devices operating in the 2400-2500 MHz band in the U.S. The 2390-2410 MHz band may be viable as an MSS (space-to-Earth) allocation because, among other things, ISM noise and interference problems would be localized.

I. ADOPTION OF APPROPRIATE POWER LIMITS IN ARTICLES 27 AND 28 WILL ENABLE MORE MSS USE OF ITS CURRENT ALLOCATIONS

A. Frequency Sharing Constraints Render Much of The Current MSS Allocations Unusable In The United States

Nine of the ten contiguous frequency bands in the 1-3 GHz range that are internationally allocated to MSS are used to varying degrees by other services in the U.S. Thus, about 183 MHz out of the allocated 289 MHz is unusable for domestic MSS as a result of spectrum consumption by other systems that operate in the same bands.[2/] TG 8/3 of the ITU-R has only just begun its work in estimating how much spectrum will be available to MSS in the current allocations taking account of the various international sharing constraints. However, based on the frequency sharing studies nearing completion in TG 2/2, it is apparent that (1) interference from foreign terrestrial stations that are visible to MSS satellites and operate in compliance with the current power limits of Article 27 would preclude U.S. use of certain MSS uplink bands (e.g., 1970-2010 MHz); and (2) the PFD levels that would generally be acceptable to foreign fixed systems in view of U.S. MSS satellites (i.e., PFD of the order of the limit of RR 2566) would preclude all but a small minority of desired domestic MSS operations, as illustrated in Table 2. Moreover, MSS systems serving areas outside the U.S. can severely limit the spectrum available for domestic service. Thus, as shown for realistic cases under the current table of allocations and the current power limits in Articles 27 and 28, only portions of the 1525-1559 MHz and 1610-1660.5 MHz bands (i.e., about 27 MHz) can be assumed to be available for MSS in the U.S.

[2/] In a band shared with terrestrial or radio astronomy stations, various combinations of frequency and distance separations are required in order to prevent interference between these stations and mobile earth stations. This necessitates that, through one of the techniques described in Table 2, mobile earth stations use locally vacant terrestrial service channels or, in more favorable cases, frequencies that are interstitial to abutting terrestrial service channels. As discussed further below on a band-by-band basis, the associated cost and capacity penalties for MSS systems increase with domestic terrestrial service spectrum occupancy.

1. Domestic Constraints in MSS Uplink Bands

1610-1626.5 MHz. According to current FCC proceedings on this band, protection of domestic radio astronomy operations in the 1610.6-1613.8 MHz band will constrain the spectrum available for MSS in the United States, but only in certain areas around several radio astronomy observatories. Assuming that U.S. GLONASS reception is ultimately to be protected only below 1610 MHz, some proposed MSS systems may have difficulty meeting the necessary standards for unwanted emissions and, as a result, may have to forego use of frequencies in the lower portion of the band. Nonetheless, it is assumed optimistically that spectrum occupancy by U.S. systems will not significantly limit the spectrum available in this band for domestic MSS.

1626.5-1660.5 MHz. The 1626.5-1660 MHz portion of this band is domestically allocated to MSS on an exclusive basis. However, the 1660.0-1660.5 MHz band is shared between MSS and radio astronomy, which limits MSS usage in the vicinity of certain radio astronomy observatories (particularly for aircraft in line-of-sight). However, for simplicity, we assume that MSS access throughout the entire band is not significantly limited by U.S. non-MSS systems.

1675-1710 MHz. Studies of incumbent and future meteorological systems and potential MSS (Earth-to-space) systems in Working Parties ("WP") 7C and 8D of the ITU-R indicate that frequency avoidance (i.e., adjacent-channel sharing), co-channel time sharing, and co-channel sharing with geographic separation between mobile earth stations and meteorological receivers are workable approaches to sharing the 1675-1710 MHz band.[3/] Of the order of 17 MHz or more may be available for domestic MSS in the near future under appropriate protection provisions for meteorological services. (In light of RR No. 735A that already provides absolute protection of meteorological services as well as potential recommendations of the Voluntary Group of Experts ("VGE") to minimize or eliminate technical provisions in the RR, the necessary sharing provisions may best be specified in ITU-R Recommendations. In any case, the current ITU-R studies likely will not be completed in time for consideration at WRC-95.)

1970-2010 MHz. This band is extensively used by fixed systems in the United States. The 1970-1990 MHz portion of the band has been allocated for terrestrial PCS. As discussed below, the 1990-2010 MHz band may be available for domestic MSS without constraints imposed by sharing with U.S. terrestrial systems.

[3/] See Technical Appendix to the Comments of AMSC on NTIA's "Preliminary Spectrum Reallocation Report," filed May 11, 1994.

2670-2690 MHz. This band is domestically used exclusively for fixed systems, including point-to-multipoint systems. Even if MSS satellites could withstand the interfering signals that would be generated by the fixed systems (which is highly doubtful), large frequency and distance separations would be needed with respect to each of the 1000 or so incumbent U.S. terrestrial stations in order to prevent interference to the fixed stations. Thus, because little or no spectrum may be available in many areas where the terrestrial stations are deployed, incumbent U.S. systems preclude practical, domestic MSS use of the band.

2. Domestic Constraints in MSS Downlink Bands

1492-1525 MHz. This band is extensively used by Mobile Aeronautical Telemetry ("MAT") systems at certain test ranges in the United States. As shown in the analysis presented in Annex B, domestic MSS could be provided on numerous narrow band channels that are interstitially grouped with respect to the MAT channels in order to preclude unacceptable interference to receiving mobile earth stations (and to protect MAT systems from MSS satellite signals). For example, groups of 30 MSS channels could be accommodated interstitially with respect to each pair of 1 MHz MAT channels such that the sharing constraints would limit the available MSS spectrum to about 5 MHz. Fewer or greater numbers of MSS channels could be accommodated on this basis depending on the MSS system characteristics.

1525-1559 MHz. This band is domestically allocated to MSS on an exclusive basis. Thus, we assume that domestic MSS access to the band is not limited by U.S. non-MSS systems.

2483.5-2500 MHz. There are of the order of 700 terrestrial system assignments in this band in the United States. Under current FCC proceedings, it may be concluded that the incumbent systems should be reaccommodated or that some yet-to-be-defined means will enable the incumbents to coexist with the proposed CDMA MSS systems. Although only 11.5 MHz is proposed to be available for CDMA uplinks in the paired 1610-1626.5 MHz band, it is assumed that domestic MSS can be provided in 16.5 MHz of downlink spectrum in this band without constraint by U.S. terrestrial systems.

2160-2200 MHz. This band is extensively used by fixed systems in the United States; however, those systems are to be reaccommodated to make room for "Emerging Technologies" such as MSS. In light of the demand for domestic MSS spectrum, and because the FCC is accommodating new terrestrial services elsewhere, it is assumed that the band will eventually be available for domestic MSS without constraints imposed by sharing with U.S. terrestrial systems.

2500-2520 MHz. This band is domestically used exclusively for fixed systems, including point-to-multipoint systems that distribute video programs using amplitude modulation. Studies in U.S. Task Group 2/2 show that these fixed systems cannot tolerate the power flux density that would be produced by MSS satellites. Thus, incumbent U.S. systems preclude domestic MSS use of the entire band.

3. International Constraints on Domestic Use of Uplink Bands

The models under consideration by Task Group 2/2 for assessing interference to MSS uplinks from fixed stations and the analyses in which these models have been applied indicate clearly that the power limits specified for terrestrial stations in RR Article 27 do not adequately protect MSS satellites. The manifest problem is that if the allowable power levels for terrestrial stations are reduced to yield tolerable levels of interference to the MSS, the power levels would be substantially less than those in current use and many types of terrestrial service operations would be precluded. In other words, co-channel sharing is not possible between an MSS satellite receiver and a substantial number of terrestrial transmitters that are in view of the satellite. Consequently, under the current provisions of Article 27, an MSS satellite serving the U.S. does not have access to uplink frequencies that are in use by foreign terrestrial systems located in view of the MSS satellite. To make matters worse, the spectrum not encumbered by terrestrial systems must be divided among MSS systems, including certain of those not covering the U.S.

4. International Constraints on Domestic Use of Downlink Bands

TG 2/2 studies indicate that the MSS PFD limit of RR No. 2566 that was tentatively adopted by WARC-92 may adequately protect terrestrial systems and that somewhat higher PFD levels may be acceptable. However, as illustrated in Table 2, these PFD levels are significantly less than the PFD needed for the types of MSS operations of interest. In other words, co-channel sharing is not possible between a transmitting MSS satellite and many types of terrestrial receivers that may be in view of the satellite. Foreign terrestrial stations located near the U.S. would be illuminated by the highest levels of PFD from a satellite using spot beams to serve the U.S. Moreover, endemic technological limits on satellite antenna discrimination make terrestrial stations in distant areas vulnerable to interference, particularly if their antenna main beams are pointed near the MSS satellite. This latter interaction is likely to occur even in bands that are only moderately occupied by foreign terrestrial systems because terrestrial station antennas in the 1-3 GHz range typically have omnidirectional beams (i.e., central station in point-to-multipoint systems) or beamwidths of the order of 3.6° (i.e., radio-relay systems). Consequently, a satellite providing domestic MSS does not necessarily have access to downlink frequencies that are used by foreign terrestrial systems in view of the MSS satellite. As in the uplink case, the spectrum not encumbered by terrestrial systems must be divided among MSS systems, including certain of those not serving the U.S.

B. Revisions to Power Limits Needed to Accommodate MSS

The 40 MHz reduction in available U.S. MSS spectrum that is attributed to foreign spectrum occupancy at 2 GHz could be substantially mitigated through a revised application of the power limits specified for terrestrial systems in RR Article 27 and for MSS satellites in RR Article 28. Task Group ("TG") 2/2 of the ITU-R is determining the power limits needed for fixed service transmitters in order to protect MSS uplinks. The power limits calculated in preliminary TG 2/2 studies are not and cannot be met by many types of fixed systems; thus, the limits would preclude co-channel MSS sharing with many of the current types of fixed systems. Likewise, TG 2/2 studies are converging on a conclusion that the Power Flux-Density ("PFD") levels required for MSS exceed the levels that can be tolerated on a co-channel basis by many types of fixed systems. It is reasonable to expect that TG 8/3 will reach similar conclusions with respect to other terrestrial services (e.g., mobile and radiolocation). Although the outcome of these studies are not yet final, AMSC and other MSS proponents have expressed a view that the forthcoming ITU-R Recommendations should specify both the protective criteria for co-channel sharing (e.g., a relatively low PFD that protects virtually all terrestrial operations) and criteria that enable the interfering service to operate at least on a non-co-channel basis (e.g., the required MSS PFD levels, which may be tolerable by some types of co-channel terrestrial operations). In order to ensure that spectrum would be available for MSS under these technical provisions, it will be necessary for WRC-95 to apply these protective and enabling criteria to different, specified parts of each MSS allocation that is shared with terrestrial services (see "frequency avoidance" approach to sharing in Table 1). U.S. proposals for application of these criteria should be based on channel plans for the incumbent users, putting special emphasis on foreign channel plans in bands designated for reaccommodation under the FCC Emerging Technology plan. In the bands concerned, half the allocated bandwidth typically amounts to less than one fixed service channel, yet thousands of MSS channels would be enabled through implementation of the allocated bandwidth.

II. THE BEST POTENTIAL NEW MSS ALLOCATIONS CAN BE IDENTIFIED ON THE BASIS OF OCCUPANCY AND INTERFERENCE FACTORS

Insofar as virtually every band not allocated to MSS in the 1-3 GHz range is used for terrestrial services, the above frequency avoidance approach could be used in establishing new, usable MSS allocations at WRC-95 and WRC-97. The potential MSS uplink allocation at 2390-2420 MHz suggested in the FCC's NOI is plagued by onerous levels of noise generated by microwave ovens and numerous other Industrial, Scientific and Medical ("ISM") devices operating in the 2400-2500 MHz band; this noise is irreducible and there are no apparent means for MSS systems to operate in its presence. However, based on U.S. spectrum occupancy and frequency sharing factors, MSS uplink allocations at 2010-2025 and 2110-2130 MHz could be established by WRC-95 for use in connection with the 2160-2180 MHz downlink band or an alternate downlink band. The most viable allocations can be identified in the FCC's Industry Advisory Committee using culling and ranking processes that evaluate spectrum occupancy, interference and MSS requirements factors.

A. The 2010-2025 MHz Band Should Be Allocated to MSS (Earth-to-space)

Allocation of the band 2010-2025 MHz to MSS (Earth-to-space) would expand upon the lower adjacent MSS allocation, some of which is rendered unusable in or near North America as a result of the FCC's PCS allocations. The Broadcast Auxiliary service (including mobile electronic news gathering operations -- "ENG") are allocated in the U.S. throughout the 1990-2025 MHz band, but expansion of the MSS allocation into the 2010-2025 MHz portion has no impact on the Broadcast Auxiliary service in addition to that which already exists from the MSS allocation spanning 1990-2010 MHz. Specifically two "Band A" channels are affected by both the existing and expanded MSS allocation, out of a total of nineteen Band A/B channels. It appears impossible for MSS service links to share with Broadcast Auxiliary mainly due to interference that could occur to Broadcast Auxiliary, particularly since many events that trigger high local congestion of Broadcast Auxiliary channels for ENG also would trigger high local demand for MSS. However, when the Commission takes steps to alleviate the current congestion of Broadcast Auxiliary channels, it could also reaccommodate operations that would be displaced in accommodating MSS at 1990-2010 MHz.

B. Man-Made Noise in the 2390-2420 MHz Band Limits Its Utility for MSS

The MSS (Earth-to-space) allocation suggested for 2390-2410 MHz in the FCC's NOI suffers problems similar to those recognized with regard to an earlier suggested and rejected allocation at

2410-2450 MHz, namely high levels of man-made noise from ISM devices, interference from U.S. "Part 15" equipment, and sharing difficulties with the fixed, mobile, radiolocation and amateur services.[4/] Table 5 shows that the level of noise power generated at an MSS satellite operating in the 2390-2410 MHz band likely would be too high to enable MSS service to handheld terminals, which necessarily are limited to very low uplink power for reasons of safety. Although vehicular MSS using relatively mobile earth station transmitter power may be possible in light of the ISM problem, it would be unwieldy if not totally impractical to provide both the extra transmitter power needed to offset ISM noise (with little risk) as well as an ample power margin for fading, and so, it is likely that only poor quality service would be available. Sharing difficulties with other services compound the MSS implementation problems. Nonetheless, the 2390-2420 MHz band should not be dismissed for MSS until it has been fully evaluated in this proceeding and the Industry Advisory Committee, especially in relation to other candidate MSS allocations. Moreover, the 2390-2410 MHz band should also be considered as a candidate MSS (space-to-Earth) allocation insofar as the noise and interference problems would become local to receiving mobile earth stations. In support of this option, it should be noted that a similarly situated MSS (space-to-Earth) allocation at 2483.5-2500 MHz has been deemed usable by four U.S. MSS applicants and potentially usable by a fifth Applicant.

C. The 2110-2130 MHz Band Will Be Orphaned and Should Be Allocated to MSS

The 2110-2130 MHz band was identified as an good MSS allocation candidate in the culling and ranking process applied by AMSC in preparation for WARC-92. At that time, on the basis of compatibility and impact studies, the band was proposed for MSS in the space-to-Earth direction. However, that band is also a good candidate for an MSS (Earth-to-space) allocation, because incumbent terrestrial systems are subject to reaccommodation under the FCC's Emerging Technologies plan; the band would be orphaned by reaccommodation of incumbent terrestrial systems that

4/ See Notice of Inquiry, Gen. Docket No. 89-554, [date]. The suggested MSS (Earth-to-space) allocation at 2410-2450 MHz was rejected in Comments by both the MSS proponents and users and manufacturers of equipment operating in the incumbent services. See, for example, Comments of Fusion Systems Corporation; International Microwave Power Institute; Dow Chemical; Amana; Omnipoint Data Communications; Raytheon; James River Corporation; CEM Corporation; Carolyn Dodson, Inc.; Enersyst Development Center, Inc.; Schwan's; Cober Electronics; APV; and University of Washington.

use the 2160-2180 MHz MSS band; and the sharing techniques in Table 1 are workable with respect to space research (deep space, Earth-to-space) systems operating in the 2110-2120 MHz portion. At this juncture of WRC preparations, this MSS allocation would preferably be made in the Earth-to-space direction of transmission in order to make usable the 20 MHz portion of the space-to-Earth allocation in the 2160-2200 MHz band that is unpaired under the evolving U.S. allocation infrastructure. Consequently, an MSS (Earth-to-space) allocation at 2110-2130 MHz should be included among the preliminary U.S. proposals.

D. Overall U.S. MSS Allocations Proposals Should Be Determined Using Culling and Ranking Processes

The work of the Industry Advisory Committee would be greatly facilitated if a structured approach were adopted for determining the best candidate MSS allocation proposals. Figure 1 and Table 5 respectively illustrate such a methodology and suggest the associated evaluation criteria. Such a process may be the only means by which the FCC can readily address the strong opposition that can be expected from incumbents in any proposed new MSS allocation because the process yields the "best" possible MSS allocations under a definition of "best" that is embedded in the process if not explicitly made in the IAC Report.

Table 1 - Frequency sharing concepts for mobile earth stations using demand assignment techniques

TECHNIQUE	METHOD FOR ASSURING ADEQUATE FREQUENCY-DISTANCE SEPARATION	COMMENTS
Frequency Assignment by Location (For Mobile Earth Station Transmission and Reception)	Using an interference-free signaling channel, the mobile earth station reports its location to the network operations center. Interference-free working channels are assigned based on a map showing the interference-free frequencies for the reported location and a list of channels not already assigned in the system. The map is pre-established based on known frequency assignments for other systems.	- Interference-free MSS signaling channels must be available for use throughout each satellite antenna beam. - Mobile earth stations must be equipped with position determination capabilities. - Location reports must be accommodated in the signaling format. - Software and a data base for assignment based on location must be integrated with the provisions for other channel assignment algorithms. - A faster network control computer system may be needed to maintain acceptable network access delay.
Frequency Avoidance	"Designated" spectrum is made available to MSS either interstitially among terrestrial service channels or in a vacated terrestrial service channel, depending on the frequency separation that is generally required between systems in the services. The designated spectrum is made available by applying sharing criteria favorable to MSS in that spectrum. Provisions in the MSS network control system ensure compliance with the applicable sharing criteria in the designated spectrum and the balance of the allocated band..	- The amount of designated spectrum must be sufficient to support MSS. - The same spectrum need not be designated uniformly on a worldwide basis; however, there must be substantial overlap between the spectrum designated in adjacent areas.

Table 1 (cont.) - Frequency sharing concepts for mobile earth stations using demand assignment techniques

TECHNIQUE	METHOD FOR ASSURING ADEQUATE FREQUENCY-DISTANCE SEPARATION	COMMENTS
Receiver Channel Probing (For Mobile Earth Station Reception)	The receiver scans system channels and maintains a current log of local interference-free system channels. The probing process may be able to distinguish assigned network channels from interference-laden channels. Using signaling protocols, the network operations center compares the list of interference-free channels with a log of available channels and assigns a channel from the intersection of these channel sets.	- Interference-free MSS signaling channels must be available for use throughout each satellite antenna beam. - Mobile earth stations must be equipped with channel probing hardware and software. - A larger mobile earth station power supply may be needed to support channel probing; - The log of interference-free channels maintained at the mobile earth station must be conveyed over signaling channels in an abbreviated form and using an efficient protocol that eases loading on the signaling channel.. - A faster network control computer could be needed to maintain acceptable network access delay.
Beacon Actuated Protection Zones (For Mobile Earth Station Transmission)	A beacon transmitter is co-located with a victim receiver to be protected and the minimum acceptable frequency offsets are used for the beacon and the receiver. The mobile earth station uses the beacon signal to determine whether it is in a restricted-frequency zone. This information is conveyed to the network operation center, which assigns an interference-free channel for use in the restricted-frequency zone when necessary.	- Interference-free MSS signaling channels must be available for use throughout each satellite antenna beam. - Beacons must be installed (practical only if there are a small number of receivers to be protected). - Mobile earth stations must be equipped with beacon signal processing capabilities. - Associated location reports must be accommodated in the signaling. - Software and a data base for assignment based on location must be integrated with the provisions for other channel assignment algorithms. - A faster network control computer likely would be needed to maintain acceptable network access delay. - This technique also may facilitate time sharing.

Table 2 - Relationship Between Maximum PFD and Potential MSS Operating Limitations

PFD LEVEL dBW/m²/4 kHz	SATELLITE DEPLOYMENT	TYPE OF MSS OPERATIONS THAT CAN BE SUPPORTED AT THE INDICATED PFD LEVELS
-152	CURRENT PFD LIMIT FOR ANGLES OF ARRIVAL BELOW 5° (RR No. 2566)	
↕ -144 |	**≤ THREE (40°-50° orbital separation)**	Transportable earth stations and ship earth stations with substantial fade margins and large reflector antennas (e.g., ≥ 80 cm aperture).
-142	CURRENT PFD LIMIT FOR ANGLES OF ARRIVAL ABOVE 25° (RR No. 2566)	
-141 | -138 |	**≤ THREE (40°-50° orbital separation)**	Above with increased fade margins or smaller antennas, plus service with low fade margins to land vehicles and aircraft using high-gain antennas (≥ 40 cm aperture) with mechanically or electrically steered beams.
-135 | -132	**≤ TWO (40°-50° orbital separation)**	Above with increased fade margins and service with low fade margins to ships and land vehicles using medium gain antennas (≥ 20 cm aperture) with azimuth steered vertical fan or steered/unsteered torroidal beams.
| -129 | -126 ↓	**ONE NARROWBAND OR UP TO FOUR CDMA**	Above with increased fade margins plus service to hand held terminals, aircraft, and land vehicles with low gain antennas and small power margins (requires user cooperation in avoiding signal impairments). Above with increased fade margins.

Notes:

1. The indicated PFD levels (column 1) are for operation at edge-of-coverage near 2.2 GHz. For operation near 1.5 GHz or 2.5 GHz, these levels are increased or decreased by approximately 1 dB, respectively.

2. Column 2 indicates the maximum number of geostationary MSS satellites that can serve the same area using the same frequencies and the minimum orbital spacing. Both of these conditions must be met in order to prevent unacceptable interference among MSS networks.

3. The highest operational PFD level currently in use in the 1-3 GHz range is of the order of -129 dBW/m²/4 kHz for ICAO-standard aeronautical mobile-satellite (R) service "P channels" serving aircraft with low gain antennas in the 1530-1559 MHz band.

DECLARATION

I, Thomas M. Sullivan, do hereby declare as follows:

1. I have a Bachelor of Science degree in Electrical Engineering and have taken numerous post-graduate courses in Physics and Electrical Engineering.

2. I am presently employed by Computer Sciences Corporation and was formerly employed by the IIT Research Institute, DoD Electromagnetic Compatibility Analysis Center.

3. I received in 1982 an official commendation from the Department of the Army for the establishment of worldwide frequency accommodations for mobile earth stations.

4. I am qualified to evaluate the technical information in the Comments of American Mobile Satellite Corporation. I am familiar with Part 25 and other relevant parts of the Commission's Rules and Regulations.

5. I have first-hand experience in the coordination of frequency assignments for mobile satellite systems.

6. I have been involved in the preparation and have reviewed the Comments of American Mobile Satellite Corporation. The technical facts contained therein are accurate to the best of my knowledge and belief.

Under penalty of perjury, the foregoing is true and correct.

July 15, 1994

Date

Thomas M. Sullivan

Thomas M. Sullivan